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means, the longer the Glas be, the bigger aperture will it bear, if the Glasses be of an equal goodnes in their kind. Therefore a six will indure a much larger Aperture then a three foot Glas; and a sixty foot Glas will proportionably bear a greater Aperture then a thirty, and will as much excel it also as a six foot does a three foot, as I have experimentally observ'd in one of that length made by Mr. Richard Reives here at London, which will bear an Aperture above three inches over, and yet make the Object proportionably big and distinct; whereas there are very few thirty foot Glasses that will indure an Aperture of more then two inches over. So that for Telescopes, supposing we had a very ready way of making their Object Glasses of exactly spherical Surfaces, we might, by increasing the length of the Glas, magnifie the Object to any assignable bigness. And for performing both these, I cannot imagine any way more easie, and more exact, then by this following Engine, by means of which, any Glasses, of what length soever, may be speedily made. It seems the most easie, because with one and the same Tool may be with care ground an Object Glas, of any length or breadth requisite, and that with very little or no trouble in fitting the Engine, and without much skill in the Grinder. It seems to be the most exact, for to the very last stroke the Glas does regulate and rectifie the Tool to its exact Figure; and the longer or more the Tool and Glas are wrought together, the more exact will both of them be of the desir'd Figure. Further, the motions of the Glas and Tool do so cross each other, that there is not one point of eithers Surface, but has thousands of cross motions thwarting it, so that there can be no kind of Rings or Gutters made either in the Tool or Glas.

The contrivance of the Engine is, only to make the ends of two large Mandrils so to move, that the Centers of them may be at any convenient distance asunder, and that the Axis of the Mandrils lying both in the same plain produc'd, may meet each other in any assignable Angle; both which requisites may be very well perform'd by the Engine describ'd in the third Figure of the first Scheme: where A B signifies the Beam of a Lath fixt perpendicularly or Horizontally, C D the two Poppet heads, fixt at about two foot distance, E F an Iron Mandril, whose tapering neck F runs in an adapted tapering brass Collar; the other end E runs on the point of a Screw G; in a convenient place of this is fastned H a pully Wheel, and into the end of it, that comes through the Poppet head C, is screwed a Ring of a hollow Cylinder K, or some other conveniently shap'd Tool, of what wideness shall

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be thought most proper for the size of Glasses, about which it is to be employ'd: As, for Object glasses, between twelve foot and an hundred foot long, the Ring may be about six inches over, or indeed somewhat more for those longer Glasses. It would be convenient also, and not very chargeable, to have four or five several Tools; as one for all Glasses between an inch and a foot, one for all Glasses between a foot and ten foot long, another for all between ten and an hundred, a fourth for all between a hundred and a thousand foot long; and if Curiosity shall ever proceed so far, one for all lengths between a thousand and ten thousand foot long; for indeed the principle is such, that supposing the Mandrils well made, and of a good length, and supposing great care be used in working and polishing them, I see no reason, but that a Glas of a thousand, nay of ten thousand foot long, may be as well made as one of ten; for the reason is the same, supposing the Mandrils and Tools be made sufficiently strong, so that they cannot bend; and supposing the Glas, out of which they are wrought, be capable of so great a regularity in its parts as to refraction: this hollow Cylinder K is to contain the Sand, and by being drove round very quick to and fro by means of a small Wheel, which may be mov'd with ones foot, serves to grind the Glas: The other Mandril is shap'd like this, but it has an even neck instead of a taper one, and runs in a Collar, that by the help of a Screw, and a joynt made like M in the Figure, it can be still adjustned to the wearing or wasting neck: into the end of this Mandril is screwed a Chock N, on which with Cement or Grew is fastned the piece of Glas Q that is to be form'd; the middle of which Glas is to be plac'd just on the edge of the Ring, and the Lath O P is to be set and fixt (by means of certain pieces and screws, the manner whereof will be sufficiently evidenc'd by the Figure) in such an Angle as is requisite to the forming of such a Sphere as the Glas is design'd to be of; the geometrical ground of which being sufficiently plain, though not heeded before, I shall, for brevities sake, pass over. This last Mandril is to be made (by means of the former, or some other Wheel) to run round very swift also, by which two cross motions the Glas cannot chuse (if care be us'd) but be wrought into a most exactly spherical Surface.

But because we are certain, from the Laws of refraction (which I have experimentally found to be so, by an Instrument I shall presently describe) that the lines of the angles of Incidence are proportionate to the lines of the angles of Refraction, therefore if Glasses could be made of those kind of Figures, or some other, such as the most incomparable Des Cartes has invented, and demonstrated in his Philosophical and Mathematical Works, we might hope for a much greater perfection of Opticks then can be rationally expected from spherical ones; for though, ceteris paribus, we find, that the larger the Telescope Object Glasses are, and the shorter those of the Microscope, the better they magnifie, yet both of them,

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